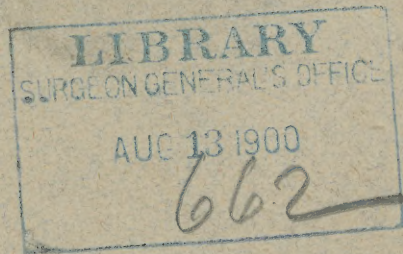


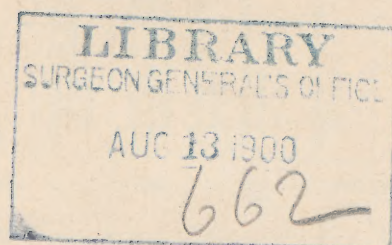
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A Year's Experience in the Treatment of Laryngeal Diphtheria with Antitoxin and Intubation.

By CHARLES GODWIN JENNINGS, M.D.



Reprinted from
THE MEDICAL AGE, FEBRUARY 25, 1898.
William M. Warren, Publisher,
Detroit, Mich.



A YEAR'S EXPERIENCE IN THE TREATMENT OF LARYNGEAL DIPHTHERIA WITH ANTITOXIN AND INTUBATION.*

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A year ago I presented to the society a report of a few cases of laryngeal diphtheria treated with antitoxin and intubation, with a brief *résumé* of the experience of other operators, showing the remarkable change in the mortality-rate of this disease that came with the introduction of antitoxin. Since that time laryngeal diphtheria has prevailed in this city and the neighboring towns to an unprecedented extent, and abundant opportunity has been given to add evidence of the value of the serum treatment.

The reports of various observers in this country and abroad have been, perhaps, sufficiently conclusive. The society may, however, be interested in the local evidence. As all cases of croup that have come under my observation during the last two years have been seen in consultation, an opportunity to estimate the attitude of the rank and file of the profession toward the use of antitoxin has been afforded. It must be confessed that antitoxin is still looked upon with suspicion and distrust by many. Whenever I have had an opportunity to show its value, distrust has given place to confidence, and if the presentation of these cases will do a little more missionary work, I shall be satisfied.

In the tables here appended are enumerated the cases seen during the last year:

NON-OPERATIVE CASES—RECOVERED.

Case.	Attending physician.	Age of patient	Duration of disease before invasion of larynx.	Duration of disease before first administration of antitoxin.	Number of doses of antitoxin.	Dose of each injection in units.	Intervals between injections.	Distribution of membrane.
1	Dr. Valade (Newport).....	4 years.	.....	4 days.	2	1500 500	24 hours.	Pharynx and larynx.
2	Dr. Campbell.	3 years.	.....	.....	3	..	.....	Severe pharyngeal exudate.
3	Dr. Clark.	4 years.	.....	3 days.	2	1000 1500	24 hours.	Pharynx, uvula, larynx.
4	Dr. E. B. Smith.	5 years.	.....	.....	2	1500 1000	24 hours.	Pharynx and larynx.
5	Dr. Sicklur.	16 years.	.....	.....	3	1500 1500 1500	.....	Pharynx (severe), larynx.
6	Dr. L. (Mt. Clemens)	3 years.	.....	3 days.	2	1000 1000	24 hours.	Pharynx and larynx.
7	Dr. Samson (Windsor).....	6 years.	.....	2 days.	2	1000 1500	.....	Pharynx and larynx.
8	Dr. Beisman.	7 years 6 mon's.	4 days.	5 days.	1	1500	.....	Larynx.

* Read before the Detroit Medical and Library Association.

OPERATIVE CASES.—RECOVERED.

Case.	Attending physician.	Age of patient.	Duration of disease before invasion of larynx.	Duration of disease before first administration of antitoxin.	Number of doses of antitoxin.	Dose of each injection in units.	Interval between injections.	Distribution of membrane.	Number of days tube remained in larynx.	Interval between first injection and intubation.	Complications and sequelæ.
1	Dr. Arthur Bennett.	6 years.	Primary	3 days.	2	1000	24 hrs.	Pharynx, larynx.	5	None.	
2	Drs. Clark and Bennett.	6 years.	Primary	3 days.	1	1000	....	Pharynx, larynx.	5	6 hours.	
3	Dr. G. H. Sherman.	5 years.	6 days.	2 days.	2	1000 1500	4 days.	Nose, pharynx, larynx.	6	4 days.	
4	Dr. McHugh.	6 years.	Primary	5 days.	3	1500 1500 1500	24 hrs. 24 hrs.	Tonsils, larynx.	5	None.	
5	Dr. McEachran.	2 years 11 mon's	Primary	1 day.	3	600 1000 1000	12 hrs. 24 hrs.	Larynx.	5	12 hrs.	Broncho-pneumonia.
6	Dr. Dewar.	3 years 8 mon's	Primary	7 days.	2	1000 500	24 hrs.	Larynx.	4	None.	
7	Dr. Reaume.	5 years.	Primary	5 days.	2	1500 500	24 hrs.	Larynx.	4	None.	
8	Dr. McHugh.	6 years.	9 days.	9 days.	3	1500 1500 500	24 hrs. 24 hrs.	Tonsils, larynx.	3*	24 hrs.	.....
9	Dr. Reaume.	3 years 6 mon's.	Primary	2 days.	2	1500 1500	24 hrs.	Larynx.	5	None.	.....
10	Drs. Newman and McPherson.	3 years 9 mon's.	Primary	2 days.	2	1000 1500	24 hrs.	Larynx.	5	12 hrs.	.....
11	Dr. Reaume.	3 years 2 mon's.	Primary	4 days.	3	1500 500 500	24 hrs. 24 hrs.	Larynx.	4	None.	.....
12	Dr. McPherson.	7 years 8 mon's.	Primary	2 days.	2	1500 1500	2 days.	Larynx.	2*	2 days.	.....
13	Dr. Cruikshank.	1 year 9 mon's.	Primary	3 days.	2	1000 1000	24 hrs.	Larynx.	3½*	None.	.....
14	Dr. LeBlanc.	2 years 11 mon's	3 days.	4 days.	2	1500 1500	5 days.	Pharynx, larynx, nose.	4	4 days.	.....
15	Dr. Wilson.	11 years.	7 days.	8 days.	3	1500 700 1500	12 hrs 24 hrs.	Nose, pharynx, larynx.	3	None.	Broncho-pneumonia.
16	Dr. Coventry.	6 years.	Primary	2 days.	1	1000	.....	Larynx.	4	None.	.....
17	Dr. Dalrymple.	3 years 4 mon's.	Primary	1 day.	2	1000 1000	24 hrs.	Larynx.	4	None.	.....
18	Dr. Henry.	1 year 11 mon's	Primary	2 days.	1	1000	....	Larynx.	4	None.	.....
19	Dr. Clippert.	3 years 11 mon's	Primary	2 days.	2	1000 1000	24 hrs.	Larynx.	4	None.	.....
20	Dr. Codey.	8 years.	5 days.	2 days.	3	1000 1500 1500	4 days. 1 day.	Larynx, pharynx.	1½*	4 days.	.....
21	Dr. Mulheron.	2 years 1 month.	2 days.	3 days.	2	750 1000	12 hrs.	Pharynx, larynx.	4½	None.	Antitoxin rash and fever.

* Coughed out.

OPERATIVE CASES.—RECOVERED.—CONTINUED.

Case.	Attending physician.	Age of patient.	Duration of disease before invasion of larynx.	Duration of disease before first administration of antitoxin.	Number of doses of antitoxin.	Dose of each injection in units.	Intervals between injections.	Distribution of membrane.	Number of days tube remained in larynx.	Interval between first injection and intubation.	Complications and sequelae.
22	Dr. Mulheron.....	5 years.	2 days.	4 days.	1	1500	....	Pharynx, tonsils, larynx.	4	None.	.....
23	Dr. Frazer.....	6 years.	....	....	2	1000 1000	24 hrs.	Pharynx, larynx.	4	None.	.....
24	Dr. Gillett.....	14 years.	3 days.	4 days.	2	1000 1500	24 hrs.	Naso phar. pharynx, larynx.	2*	None.	.....
25	Dr. Jacob.....	4 years.	12 days.	2 weeks	2	1500 1500	24 hrs.	Nose, pharynx, larynx.	4½	None.	.....
26	Dr. Winters.....	18 mon's	Primary	2 days.	2	1000 1000	24 hrs.	Larynx.	7	None.	Broncho-pneumonia.
27	Dr. Davis.....	4 years.	2 days.	3 days.	2	2000 1500	24 hrs.	Pharynx, larynx.	4	None.	.....
28	Dr. Hare..... (Walkerville).	5 years.	....	...	2	1000 1000	36 hrs.	Pharynx, larynx.	4	None.	Broncho-pneumonia.
29	Dr. Winters.. . . .	5 years.	....	....	2	1500 1500	24 hrs.	Larynx.	4	None.	.....

OPERATIVE CASES.—DIED.

Case	Attending physician.	Age of patient.	Duration of disease before invasion of larynx.	Duration of disease before first administration of antitoxin.	Number of doses of antitoxin.	Dose of each injection in units.	Intervals between injections.	Distribution of membrane.	Interval between first injection and operation.	Interval between operation and death.	Cause of death.
1	Dr. D. L. Parker	5 years	....	....	1	1500	....	Larynx.	3 hrs.	No.	Accident of operation.
2	Dr. Cruikshank..... (Windsor.)	2 years 3 mos.	....	1 day.	2	1500 1000	24 hrs.	Larynx.	None.	36 hrs	Extension of membrane.
3	Dr. Utter.....	11 mos.	....	....	1	500	....		None.	24 hrs	Broncho-pneumonia.
4	Dr. Palmer.....	14 years.	....	....	1	1500	....	Pharynx, larynx.	None.	18 hrs	Exhaustion.
5	Dr. Ketchum.....	4 years.	....	....	1	1500	....	Larynx.	None.	3 days	Broncho-pneumonia.
6	Dr. McPherson.....	5 years.	....	....	1	1000	....	Pharynx, larynx.	None.	3 hrs.	Plugging of tube.

Summary.—Total number of cases treated by antitoxin or intubation, or both, 43; of this number 6 died and 37 recovered. Number of cases treated by antitoxin, without operation, 8, all of which recovered. Number of cases operated upon 35, with 29 recoveries and 6 deaths.

Fatal Cases.—It will be well first to analyze the fatal cases:

Case 1.—Case seen by Dr. Parker 10 A.M., November 18. Given 1500 units

of antitoxin at 11 A.M. Moribund at 3 P.M. Attempt at intubation at 3 P.M. Thread of tube caught on button of assistant's coat, causing failure to lodge the tube in the larynx. Death of child. Rapid tracheotomy. Failure to resuscitate. This case died four hours after the injection of antitoxin. The death cannot be charged against the remedy, as an earlier injection and operation would have saved the child.

Case 2.—Aged two years and three months. Died of pneumonia thirty-six hours after intubation.

Case 3.—Aged eleven months. This was a case of severe laryngeal, tracheal and bronchial catarrh. There was no clinical evidence of membrane, and culture was negative. Antitoxin and intubation as a forlorn hope. In the absence of every evidence of Klebs-Loeffler infection, this case should not be charged to antitoxin.

Case 4.—A girl fourteen years of age. When I saw her she was moribund. She had suffered with grave stenosis for two or three days, and she had been exhausted by repeated attempts at intubation by an incompetent operator. Antitoxin was not given until after operation, and only a few hours before she died. Intubation gave perfect relief to respiration, but she sank and died of pulmonary engorgement twelve hours after. A reasonably early operation and injection would almost certainly have saved her life.

Case 5.—Aged four. Died of bronchopneumonia three days after operation.

Case 6.—Aged five years. At the time of intubation the trachea and bronchi were filled with tough membrane, and three or four introductions of the tube were necessary before enough was dislodged to permit of free respiration. Three hours after the intubation and injection a piece of membrane loosened from below plugged the tube and killed the child in a few moments.

Of the six fatal cases, then, but two, Nos. 2 and 5, were treated sufficiently early to justify their inclusion in an estimate of the value of antitoxin.

Eliminating, as I believe we justly can, the other four cases, the results would be: Thirty-nine cases with two deaths; thirty-one intubations with two deaths. Such results need no comment. To those who know from many sad experiences the terrible fatality of diphtheritic laryngitis before the days of antitoxin, both with and without operation, they seem almost miraculous.

These results are not exceptional, as the reports of a number of operators show, and it is remarkable that physicians who meet diphtheritic croup hesitate so to use the only remedy that can influence the progress of the disease.

Of these forty-three cases treated by antitoxin, only fourteen received the serum before I saw them in consultation. From my conversation at consultations I find that there are two chief reasons for hesitancy: (1) uncertainty in diagnosis, and (2) fear of untoward action of the remedy.

The diagnosis of laryngeal obstruction caused by membranous laryngitis is usually correctly made; the question of doubt appears to be whether or not the disease is diphtheria. The old chimera, *membranous croup*, is hard to down. The clear-cut pathological fact that ~~primary~~ ^{primary} membranous laryngitis is almost without exception Klebs-Loeffler infection finds a tardy acceptance in most medical minds. That the streptococcus or other organism may and occasionally does excite a laryngeal pseudo-membranous inflammation is true;

still, it is exceptional, and so far as the immediate treatment of the case is concerned, of no importance. In cases of doubt the rule of action should be, *give the antitoxin and settle the question of diagnosis afterwards.*

The extensive use of antitoxin and the rarity of accident attributable to it are rapidly overcoming the fear of the remedy that was aroused by a few unfortunate cases early in the history of serum therapeutics, and which has been fostered by the virulent opposition of a few irresponsible editors who know nothing of diphtheria, and who probably never saw a case of croup.

Still I find that physicians often hesitate and delay because of the fear of adding a new danger to the one already manifest. In one case I saw an able physician carry to a croup patient a bottle of antitoxin with every visit for two or three days, and then did not use it until bolstered up by consultation.

A glance at this report shows how groundless are such fears. But one case showed any toxic effect; this was an erythema and mild febrile disturbance lasting about a week.

Antitoxin.—Except in Cases 1 and 2, Parke, Davis & Co.'s antitoxin was used.

The Dose.—When I find antitoxin has been given it is usually in insufficient doses. Although I myself have not given the large dose recommended in the report of the American Pediatric Society, and although the results obtained by the smaller dose are all one could expect, I believe I have been in error in not administering the maximum dose at the beginning. I am convinced by the experience of others, and particularly by that of my colleague, Dr. B. R. Shurly, that a full dose given early will save many cases from the necessity of operation.

For children under two years 1500 units, repeated in twelve, twenty-four or thirty-six hours, should be given. A third or fourth dose may be given, if necessary. For children over two years, 2000 units, repeated in the same manner. *When in doubt use the large dose.*

Course of the Disease after Intubation.—The report shows the infrequency and the mildness of the complications and sequelæ in croup cases treated with antitoxin. In one case only out of the series did the serum fail immediately to arrest the extension of membrane. Convalescence is rapid and perfect. The tube can usually be removed at the end of the fourth day; before antitoxin it was necessary to keep it in for six or seven days.

Laryngeal invasion most frequently characterizes diphtheria of a mild type, and particularly in cases in which the exudate is confined to the pharynx.

Early injection of antitoxin checks extension to the larynx. To prevent and arrest laryngeal diphtheria the rules of action should be: Administer antitoxin at the earliest possible moment to every case of diphtheria, however mild. Immediately on the appearance of hoarseness and aphonia, the indications of laryngeal invasion, push the drug to the maximum limit.

In every case of doubt give antitoxin.

The operation of intubation should be only in the hands of the expert. The general practitioner, however, can make the services of an expert rarely necessary if he will treat his diphtheria cases by the early and vigorous administration of antitoxin.

